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Microprocessor Supervisory Circuits in 3-Lead SC70 and SOT-23

ADM803/ADM809/ADM810

FEATURES
- Specified over Temperature
- Low Power Consumption (17 μA)
- Precision Voltage Monitor: 2.5 V, 3 V, 3.3 V, 5 V Options
- Reset Assertion Down to 1 V V_{CC}
- 140 ms Min Power-On Reset
  - Open-Drain $\overline{\text{RESET}}$ Output (ADM803)
  - Push-Pull $\overline{\text{RESET}}$ Output (ADM809)
  - Push-Pull RESET Output (ADM810)
- SC70 and SOT-23 Packages

APPLICATIONS
- Microprocessor Systems
- Computers
- Controllers
- Intelligent Instruments
- Automotive Systems

FUNCTIONAL BLOCK DIAGRAM

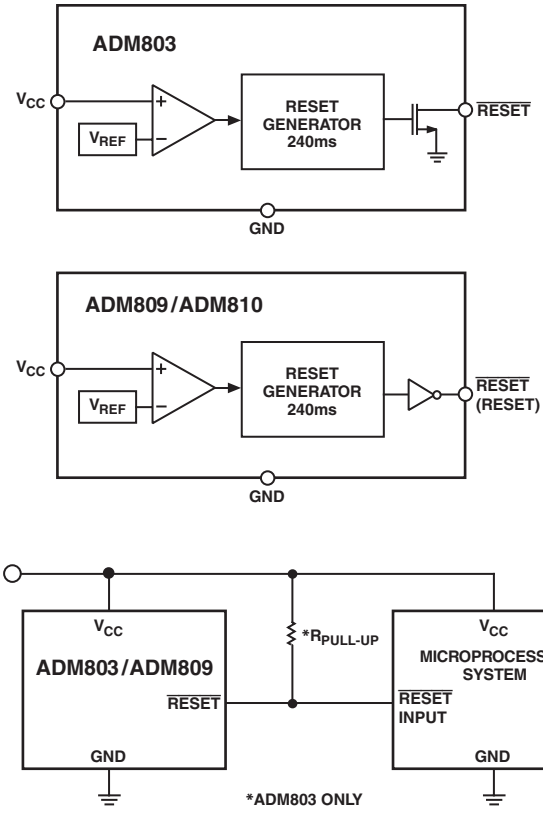

Figure 1. Typical Operating Circuit

GENERAL DESCRIPTION

The ADM803/ADM809/ADM810 supervisory circuits monitor the power supply voltage in microprocessor systems. They provide a reset output during power-up, power-down, and brownout conditions. On power-up, an internal timer holds reset asserted for 240 ms. This holds the microprocessor in a reset state until conditions have stabilized. The $\overline{\text{RESET}}$ output remains operational with V_{CC} as low as 1 V. The ADM803 and ADM809 provide an active low reset signal ($\overline{\text{RESET}}$), while the ADM810 provides an active high signal (RESET) output. The ADM809 and ADM810 have push-pull outputs whereas the ADM803 has an open-drain output, which requires an external pull-up resistor.

Seven reset threshold voltage options are available, suitable for monitoring a variety of supply voltages. Refer to Table I.

The reset comparator features built-in glitch immunity, making it immune to fast transients on V_{CC}.

The ADM803/ADM809/ADM810 consume only 17 μA, making it suitable for low power portable equipment. The ADM803 is available in a 3-lead SC70; the ADM809/ADM810 is available in 3-lead SOT-23 and SC70 packages.

REV. C

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ADM803/ADM809/ADM810–SPECIFICATIONS (V_{CC} = full operating range, $T_A = T_{MIN}$ to T_{MAX}, V_{CC} Typ = 5 V for L/M/J models, 3.3 V for T/S models, 3 V for R models, 2.5 V for Z models, unless otherwise noted.)

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
V_{CC} OPERATING VOLTAGE RANGE	1.0		5.5	V	T_A = 0°C to 70°C
	1.2		5.5	V	T_A = –40°C to +125°C
Supply Current		24	35	µA	V_{CC} < 5.5 V, ADM8_L/M/J, T_A = –40°C to +85°C
		17	30	µA	V_{CC} < 3.6 V, ADM8_R/S/T/Z, T_A = –40°C to +85°C
			60	µA	V_{CC} < 5.5 V, ADM8_L/M/J, T_A = 85°C to 125°C
			60	µA	V_{CC} < 3.6 V, ADM8_R/S/T/Z, T_A = 85°C to 125°C
RESET THRESHOLD					
Reset Voltage Threshold					
ADM8_L	4.56	4.63	4.70	V	T_A = 25°C
ADM8_L	4.50		4.75	V	T_A = –40°C to +85°C
ADM8_L	4.44		4.82	V	T_A = –40°C to +125°C
ADM8_M	4.31	4.38	4.45	V	T_A = 25°C
ADM8_M	4.25		4.50	V	T_A = –40°C to +85°C
ADM8_M	4.20		4.56	V	T_A = –40°C to +125°C
ADM8_J*	3.93	4.00	4.06	V	T_A = 25°C
ADM8_J*	3.89		4.10	V	T_A = –40°C to +85°C
ADM8_J*	3.80		4.20	V	T_A = –40°C to +125°C
ADM8_T	3.04	3.08	3.11	V	T_A = 25°C
ADM8_T	3.00		3.15	V	T_A = –40°C to +85°C
ADM8_T	2.95		3.21	V	T_A = –40°C to +125°C
ADM8_S	2.89	2.93	2.96	V	T_A = 25°C
ADM8_S	2.85		3.00	V	T_A = –40°C to +85°C
ADM8_S	2.81		3.05	V	T_A = –40°C to +125°C
ADM8_R	2.59	2.63	2.66	V	T_A = 25°C
ADM8_R	2.55		2.70	V	T_A = –40°C to +85°C
ADM8_R	2.52		2.74	V	T_A = –40°C to +125°C
ADM8_Z	2.28	2.32	2.35	V	T_A = 25°C
ADM8_Z	2.25		2.38	V	T_A = –40°C to +85°C
ADM8_Z	2.22		2.42	V	T_A = –40°C to +125°C
RESET THRESHOLD TEMPERATURE COEFFICIENT		30		ppm/°C	
V_{CC} to Reset Delay		20		µs	V_{CC} = V_{TH} to (V_{TH} – 100 mV)
RESET ACTIVE TIMEOUT PERIOD	140	240	460	ms	T_A = –40°C to +85°C
	100		840	ms	T_A = 85°C to 125°C
$\overline{\text{RESET}}$ OUTPUT VOLTAGE LOW (ADM803/ADM809)			0.3	V	V_{CC} = V_{TH} min, I_{SINK} = 1.2 mA, ADM803R/S/T/Z, ADM809R/S/T/Z
			0.4	V	V_{CC} = V_{TH} min, I_{SINK} = 3.2 mA, ADM803L/M/J, ADM809L/M/J
			0.3	V	V_{CC} >1.0 V, I_{SINK} = 50 µA
$\overline{\text{RESET}}$ OUTPUT VOLTAGE HIGH (ADM809)	0.8 V_{CC}			V	V_{CC} > V_{TH} max, I_{SOURCE} = 500 µA, ADM809R/S/T/Z
	V_{CC} – 1.5			V	V_{CC} > V_{TH} max, I_{SOURCE} = 800 µA, ADM809L/M/J
RESET OUTPUT VOLTAGE LOW (ADM810)			0.3	V	V_{CC} = V_{TH} min, I_{SINK} = 1.2 mA, ADM810R/S/T/Z
			0.4	V	V_{CC} = V_{TH} min, I_{SINK} = 3.2 mA, ADM810L/M/J
RESET OUTPUT VOLTAGE HIGH (ADM810)	0.8 V_{CC}			V	1.8 V < V_{CC} < V_{TH} min, I_{SOURCE} = 150 µA
$\overline{\text{RESET}}$ OPEN-DRAIN OUTPUT Leakage Current (ADM803)			1	µA	V_{CC} > V_{TH}, reset de-asserted

*ADM809/ADM810 only.
Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS*

(T_A = 25°C, unless otherwise noted.)

V_{CC} . . . . . –0.3 V to +6 V
RESET, $\overline{\text{RESET}}$ . . . . . –0.3 V to V_{CC} + 0.5 V
Input Current
  V_{CC} . . . . . 20 mA
Output Current
  RESET, $\overline{\text{RESET}}$ . . . . . 20 mA
Rate of Rise, V_{CC} . . . . . 100 V/µs
θ_{JA} Thermal Impedance, SC70 . . . . . 146°C/W
θ_{JA} Thermal Impedance, SOT-23 . . . . . 270°C/W
Lead Temperature (Soldering, 10 sec) . . . . . 300°C
  Vapor Phase (60 sec) . . . . . 215°C
  Infrared (15 sec) . . . . . 220°C
Storage Temperature Range . . . . . –65°C to +150°C

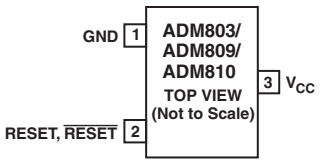
*Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum ratings for extended periods of time may affect device reliability.

Table I. Reset Threshold Options

RESET Model	Threshold (V)
ADM8_L	4.63
ADM8_M	4.38
ADM8_J*	4.00
ADM8_T	3.08
ADM8_S	2.93
ADM8_R	2.63
ADM8_Z	2.32

*ADM809/ADM810 only.

PIN CONFIGURATION



PIN FUNCTION DESCRIPTIONS

Pin No.	Mnemonic	Function
1	GND	0 V. Ground reference for all signals.
2	$\overline{\text{RESET}}$ (ADM803/ ADM809)	Active Low Logic Output. $\overline{\text{RESET}}$ remains low while V_{CC} is below the reset threshold and remains low for 240 ms (typ) after V_{CC} rises above the reset threshold.
2	RESET (ADM810)	Active High Logic Output. RESET remains high while V_{CC} is below the reset threshold and remains high for 240 ms (typ) after V_{CC} rises above the reset threshold.
3	V_{CC}	Supply Voltage Being Monitored.

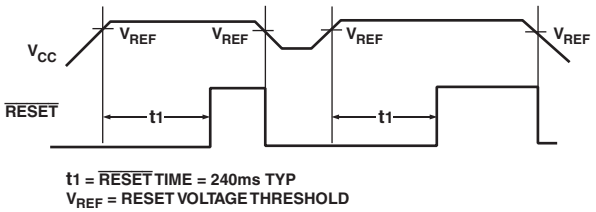


Figure 2. Power Fail Reset Timing

CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADM803/ADM809/ADM810 feature proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

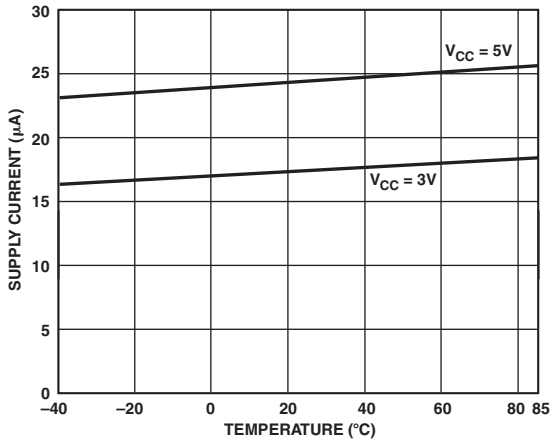
ORDERING GUIDE (ADM803 and ADM809)

Model	Reset Threshold (V)	Temperature Range	Branding	Quantity	Package Type
ADM803LAKS-REEL	4.63	–40°C to +125°C	M02	10 k	3-Lead SC70
ADM803LAKS-REEL-7	4.63	–40°C to +125°C	M02	3 k	3-Lead SC70
ADM803MAKS-REEL	4.38	–40°C to +125°C	M03	10 k	3-Lead SC70
ADM803MAKS-REEL-7	4.38	–40°C to +125°C	M03	3 k	3-Lead SC70
ADM803TAKS-REEL	3.08	–40°C to +125°C	M05	10 k	3-Lead SC70
ADM803TAKS-REEL-7	3.08	–40°C to +125°C	M05	3 k	3-Lead SC70
ADM803SAKS-REEL	2.93	–40°C to +125°C	M06	10 k	3-Lead SC70
ADM803SAKS-REEL-7	2.93	–40°C to +125°C	M06	3 k	3-Lead SC70
ADM803RAKS-REEL	2.63	–40°C to +125°C	M07	10 k	3-Lead SC70
ADM803RAKS-REEL-7	2.63	–40°C to +125°C	M07	3 k	3-Lead SC70
ADM803ZAKS-REEL	2.32	–40°C to +125°C	M08	10 k	3-Lead SC70
ADM803ZAKS-REEL-7	2.32	–40°C to +125°C	M08	3 k	3-Lead SC70
ADM809LART-REEL	4.63	–40°C to +125°C	9LXX	10 k	3-Lead SOT-23
ADM809LART-REEL-7	4.63	–40°C to +125°C	9LXX	3 k	3-Lead SOT-23
ADM809LAKS-REEL	4.63	–40°C to +125°C	M9A	10 k	3-Lead SC70
ADM809LAKS-REEL-7	4.63	–40°C to +125°C	M9A	3 k	3-Lead SC70
ADM809MART-REEL	4.38	–40°C to +125°C	9MXX	10 k	3-Lead SOT-23
ADM809MART-REEL-7	4.38	–40°C to +125°C	9MXX	3 k	3-Lead SOT-23
ADM809MAKS-REEL	4.38	–40°C to +125°C	M9B	10 k	3-Lead SC70
ADM809MAKS-REEL-7	4.38	–40°C to +125°C	M9B	3 k	3-Lead SC70
ADM809JART-REEL	4.00	–40°C to +125°C	9JXX	10 k	3-Lead SOT-23
ADM809JART-REEL-7	4.00	–40°C to +125°C	9JXX	3 k	3-Lead SOT-23
ADM809JAKS-REEL	4.00	–40°C to +125°C	M9C	10 k	3-Lead SC70
ADM809JAKS-REEL-7	4.00	–40°C to +125°C	M9C	3 k	3-Lead SC70
ADM809TART-REEL	3.08	–40°C to +125°C	9TXX	10 k	3-Lead SOT-23
ADM809TART-REEL-7	3.08	–40°C to +125°C	9TXX	3 k	3-Lead SOT-23
ADM809TAKS-REEL	3.08	–40°C to +125°C	M9D	10 k	3-Lead SC70
ADM809TAKS-REEL-7	3.08	–40°C to +125°C	M9D	3 k	3-Lead SC70
ADM809SART-REEL	2.93	–40°C to +125°C	9SXX	10 k	3-Lead SOT-23
ADM809SART-REEL-7	2.93	–40°C to +125°C	9SXX	3 k	3-Lead SOT-23
ADM809SAKS-REEL	2.93	–40°C to +125°C	M9E	10 k	3-Lead SC70
ADM809SAKS-REEL-7	2.93	–40°C to +125°C	M9E	3 k	3-Lead SC70
ADM809RART-REEL	2.63	–40°C to +125°C	9RXX	10 k	3-Lead SOT-23
ADM809RART-REEL-7	2.63	–40°C to +125°C	9RXX	3 k	3-Lead SOT-23
ADM809RAKS-REEL	2.63	–40°C to +125°C	M9F	10 k	3-Lead SC70
ADM809RAKS-REEL-7	2.63	–40°C to +125°C	M9F	3 k	3-Lead SC70
ADM809ZART-REEL	2.32	–40°C to +125°C	9ZXX	10 k	3-Lead SOT-23
ADM809ZART-REEL-7	2.32	–40°C to +125°C	9ZXX	3 k	3-Lead SOT-23
ADM809ZAKS-REEL	2.32	–40°C to +125°C	M9G	10 k	3-Lead SC70
ADM809ZAKS-REEL-7	2.32	–40°C to +125°C	M9G	3 k	3-Lead SC70

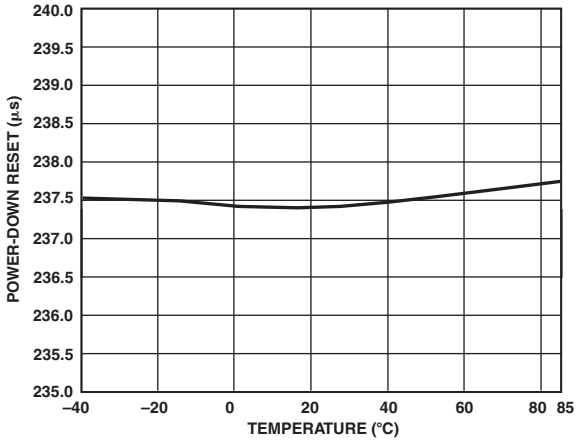
ORDERING GUIDE (ADM810)

Model	Reset Threshold (V)	Temperature Range	Branding	Quantity	Package Type
ADM810LART-REEL	4.63	–40°C to +125°C	ALXX	10 k	3-Lead SOT-23
ADM810LART-REEL-7	4.63	–40°C to +125°C	ALXX	3 k	3-Lead SOT-23
ADM810LAKS-REEL	4.63	–40°C to +125°C	MAA	10 k	3-Lead SC70
ADM810LAKS-REEL-7	4.63	–40°C to +125°C	MAA	3 k	3-Lead SC70
ADM810MART-REEL	4.38	–40°C to +125°C	AMXX	10 k	3-Lead SOT-23
ADM810MART-REEL-7	4.38	–40°C to +125°C	AMXX	3 k	3-Lead SOT-23
ADM810MAKS-REEL	4.38	–40°C to +125°C	MAB	10 k	3-Lead SC70
ADM810MAKS-REEL-7	4.38	–40°C to +125°C	MAB	3 k	3-Lead SC70
ADM810JART-REEL	4.00	–40°C to +125°C	AJXX	10 k	3-Lead SOT-23
ADM810JART-REEL-7	4.00	–40°C to +125°C	AJXX	3 k	3-Lead SOT-23
ADM810JAKS-REEL	4.00	–40°C to +125°C	MAC	10 k	3-Lead SC70
ADM810JAKS-REEL-7	4.00	–40°C to +125°C	MAC	3 k	3-Lead SC70
ADM810TART-REEL	3.08	–40°C to +125°C	ATXX	10 k	3-Lead SOT-23
ADM810TART-REEL-7	3.08	–40°C to +125°C	ATXX	3 k	3-Lead SOT-23
ADM810TAKS-REEL	3.08	–40°C to +125°C	MAD	10 k	3-Lead SC70
ADM810TAKS-REEL-7	3.08	–40°C to +125°C	MAD	3 k	3-Lead SC70
ADM810SART-REEL	2.93	–40°C to +125°C	ASXX	10 k	3-Lead SOT-23
ADM810SART-REEL-7	2.93	–40°C to +125°C	ASXX	3 k	3-Lead SOT-23
ADM810SAKS-REEL	2.93	–40°C to +125°C	MAE	10 k	3-Lead SC70
ADM810SAKS-REEL-7	2.93	–40°C to +125°C	MAE	3 k	3-Lead SC70
ADM810RART-REEL	2.63	–40°C to +125°C	ARXX	10 k	3-Lead SOT-23
ADM810RART-REEL-7	2.63	–40°C to +125°C	ARXX	3 k	3-Lead SOT-23
ADM810RAKS-REEL	2.63	–40°C to +125°C	MAF	10 k	3-Lead SC70
ADM810RAKS-REEL-7	2.63	–40°C to +125°C	MAF	3 k	3-Lead SC70
ADM810ZART-REEL	2.32	–40°C to +125°C	AZXX	10 k	3-Lead SOT-23
ADM810ZART-REEL-7	2.32	–40°C to +125°C	AZXX	3 k	3-Lead SOT-23
ADM810ZAKS-REEL	2.32	–40°C to +125°C	MAG	10 k	3-Lead SC70
ADM810ZAKS-REEL-7	2.32	–40°C to +125°C	MAG	3 k	3-Lead SC70

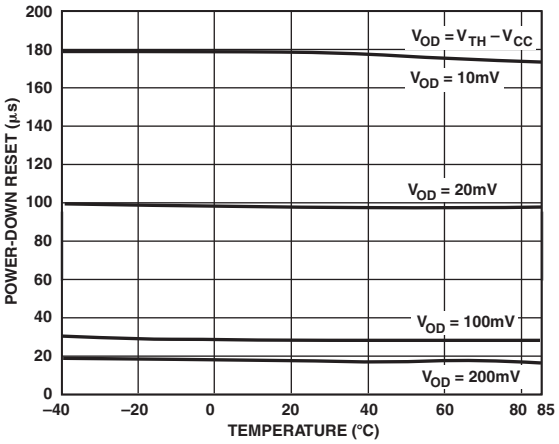
ADM803/ADM809/ADM810–Typical Performance Characteristics



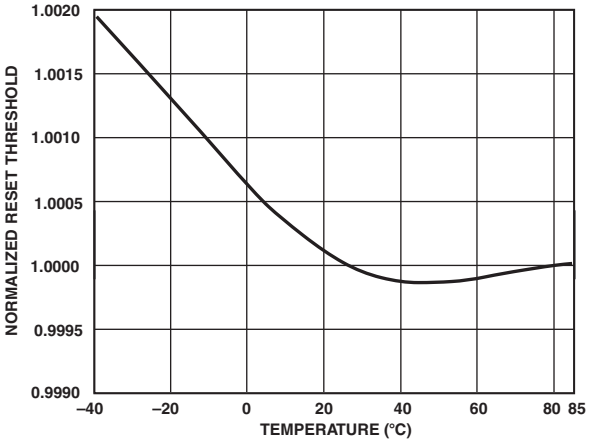
TPC 1. Supply Current vs. Temperature (No Load)



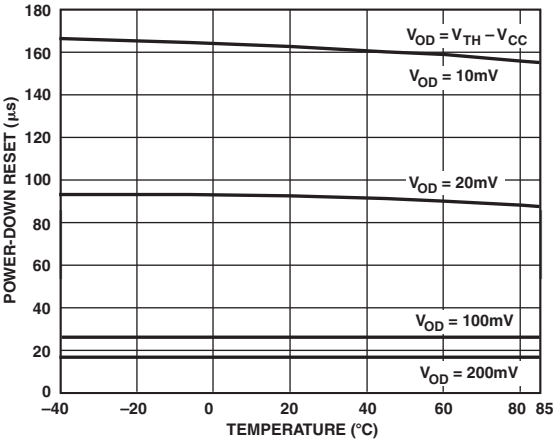
TPC 4. Power-Down RESET Delay vs. Temperature ADM8_R



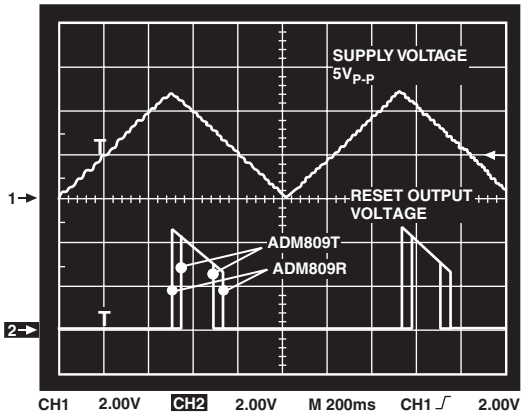
TPC 2. Power-Down RESET Delay vs. Temperature ADM8_L/M/J



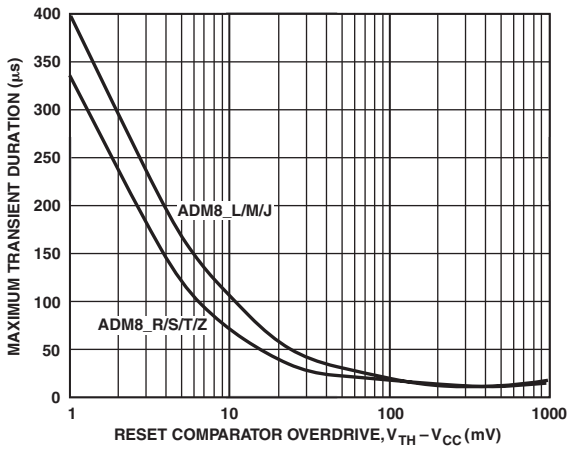
TPC 5. Normalized RESET Voltage Threshold vs. Temperature



TPC 3. Power-Down RESET Delay vs. Temperature ADM8_T/S/R/Z



TPC 6. RESET Output Voltage vs. Supply Voltage



TPC 7. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

INTERFACING TO OTHER DEVICES' OUTPUT

The ADM803/ADM809/ADM810 series is designed to integrate with as many devices as possible and, therefore, has a standard output dependent on V_{CC}. This enables the part to be used in both 3 V and 5 V or any nominal voltage within the minimum and maximum specifications for V_{CC}. Because of this design approach, interfacing this device to other devices is simplified.

Ensuring a Valid Reset Output Down to V_{CC} = 0 V

When V_{CC} falls below 0.8 V, the ADM803/ADM809's $\overline{\text{RESET}}$ no longer sinks current. A high impedance CMOS logic input connected to $\overline{\text{RESET}}$ may, therefore, drift to undetermined logic levels. To eliminate this problem, a 100 kΩ resistor should be connected from $\overline{\text{RESET}}$ to ground.

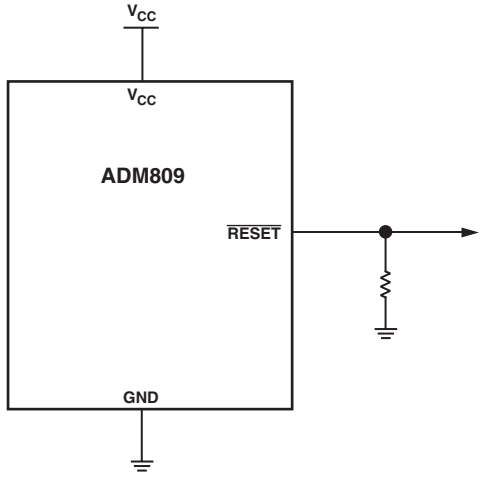


Figure 3. Ensuring a Valid Reset Output Down to V_{CC} = 0 V

Benefits of a Very Accurate Reset Threshold

In other microprocessor supervisory circuits, tolerances in supply voltages lead to an overall increase in reset tolerance levels due to the deterioration of the microprocessor reset circuit's power supply. The possibility of a malfunction during a power failure is greatly reduced because the ADM803/ADM809/ADM810 series can operate effectively even when there are large degradations of the supply voltages. Another advantage of the ADM803/ADM809/ADM810 series is its very accurate internal voltage reference circuit. These benefits combine to produce an exceptionally reliable voltage monitor circuit.

Interfacing to Microprocessors with Multiple Interrupts

In a number of cases, it is necessary to interface many interrupts from different devices (e.g., thermal, altitude, and velocity sensors). The ADM803/ADM809/ADM810 can easily be integrated into existing interrupt-handling circuits (Figure 4) or be used as a standalone device.

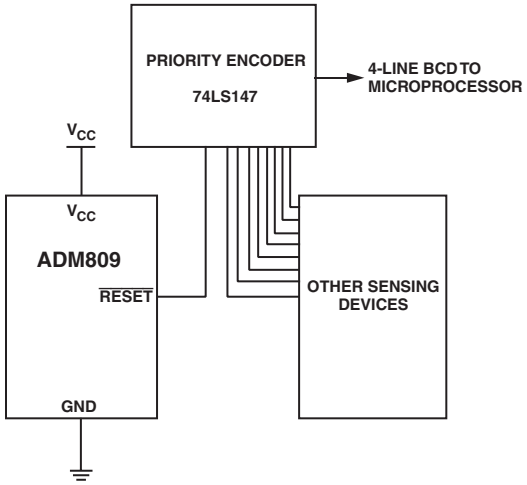
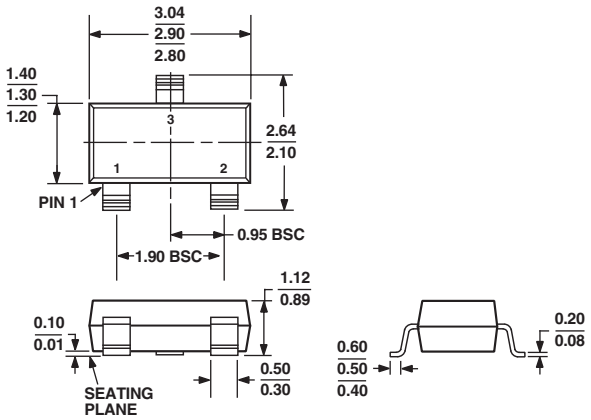


Figure 4. Interfacing to Microprocessors with Multiple Interrupts

OUTLINE DIMENSIONS

3-Lead Small Outline Transistor Package [SOT-23]
(RT-3)

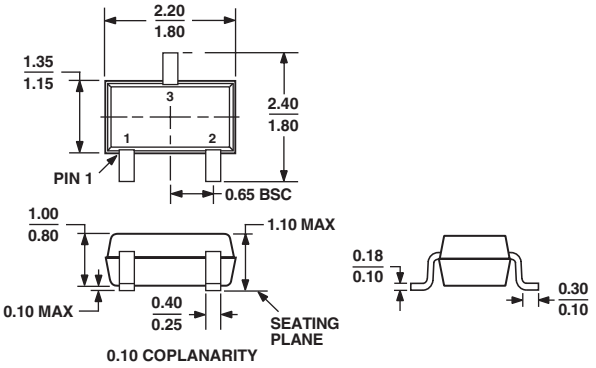
Dimensions shown in millimeters



COMPLIANT TO JEDEC STANDARDS TO-236AB

3-Lead Thin Shrink Small Outline Transistor Package [SC70]
(KS-3)

Dimensions shown in millimeters



Revision History

Location	Page
6/03—Data Sheet changed from REV. B to REV. C.	
Added ADM803	Universal
Changes to FEATURES	1
Changes to GENERAL DESCRIPTION	1
Changes to Figure 1	1
Changes to SPECIFICATIONS	2
Changes to Table I	3
Updated ORDERING GUIDE	4
1/03—Data Sheet changed from REV. A to REV. B.	
Changes to SPECIFICATIONS	2
Changes to Table I	3
Changes to ORDERING GUIDE	4
Changes to TPCs 1–3, and TPC 7	5
Updated OUTLINE DIMENSIONS	7
10/02—Data Sheet changed from REV. 0 to REV. A.	
Addition of SC70 package	Universal
Change to GENERAL DESCRIPTION	1
Changes to SPECIFICATIONS	2
Changes to ABSOLUTE MAXIMUM RATINGS	3
Change to Table I	3
Change to ORDERING GUIDE	4
Change to TPC 1	5
Updated OUTLINE DIMENSIONS	7